

**REMARKS**

Claims 18-35 are pending in the above-identified application. In the Office Action, claims 18-35 were rejected.

**I. Objection to Drawings**

The Examiner objected to the drawings for not showing a means of mixing the diesel fuel, water and air. However, Figure 1 clearly shows the diesel fuel, water and air mixing in the SCWR 201. Therefore, the means for mixing the diesel fuel, water and air is clearly shown. Applicants therefore respectfully request the withdrawal of this objection.

**II. 35 U.S.C. § 112 Written Description And Indefiniteness Rejections of Claims**

Claims 18-35 were rejected under 35 U.S.C. § 112, first paragraph.

Applicant respectfully traverses this rejection.

In the Office Action of September 30, 2008, the Examiner rejected claims 18-35 for claiming "...at least one pre-heater in thermal communication with said water feed and said diesel fuel, etc." See, Office Action of September 30, 2008 at Page 2.

The use of at least one pre-heater is disclosed in the specification on at least page 11, where the specification discloses "before the water and diesel fuel are mixed in SCW reactor (201), they will generally pass through preheaters (107) ..." See, Specification at Page 11.

Applicants respectfully request the withdrawal of this rejection.

Claim 26 was rejected under 35 U.S.C. § 112, first paragraph. Applicant respectfully traverses this rejection.

In relevant part, independent claim 26 recites:

“means for creating a mixture of the preheated diesel fuel, the preheated water, and air;”

...and

“means for taking said mixture and increasing pressure and temperature to make said water supercritical;”

In the Office Action of September 30, 2008, the Examiner rejected claim 26 for claiming “a means for creating a mixture of preheated diesel fuel, the preheated water and air.” See, Office Action of September 30, 2008 at Page 3.

Further, the Examiner contends that the specification fails to disclose “...mixing the three feeds of fuels, water and air prior to entering the SCW reactor.” See, *Id.* However, claim 26 does not recite mixing the three feeds of fuels, water and air **prior to entering the SCW reactor**. Specifically, claim 26 recites “means for creating a mixture of the preheated diesel fuel, the preheated water, and air.”

The “means for creating a mixture of preheated diesel fuel, the preheated water and air” is disclosed in the specification on at least page 11 where the specification discloses “Before the water and diesel fuel are mixed in the SCW reactor...” and “the air and supercritical water are mixed prior to entering the SCW reactor (201).” See, Specification at Page 11.

Applicant respectfully requests the withdrawal of this rejection.

Claim 18-35 was rejected under 35 U.S.C. § 112, second paragraph.

The Examiner rejected claims 18-35 for allegedly omitting structural cooperative relationships between the SCW reactor and the WGS reactor. Applicant respectfully disagrees.

In relevant part, each of the independent claims 18 and 27 recite:

“wherein **said synthesis gas output by said SCW reactor is fed into said WGS reactor** which converts said carbon monoxide into carbon dioxide and hydrogen and outputs an output gas including a higher percentage of hydrogen to carbon monoxide compared to said synthesis gas.” Therefore, the SCW and WGS are connected in such a manner as the output from the SCW feeds synthesis gas to the WGS reactor. This cooperative relationship is supported both in Figure 1 and in the last paragraph of Page 11 of the Specification. See Original Application at Page 11, l. 13-23; Fig. 1.

Because the required structural cooperative is present, Applicant respectfully requests the withdrawal of this rejection.

### **III. 35 U.S.C. § 103 Obviousness Rejection of Claims**

Claims 18-35 were rejected under 35 U.S.C. § 103(a) as being purportedly unpatentable over *Hokari et al.* (US 2003/0168381) in view of *Wright et al.* (US 5,141,823).

With respect to independent claim 18 as amended and referencing Fig. 1 for illustrative purposes, Applicants claim a system 50 for reforming diesel fuel into hydrogen. The system 50 includes, in relevant part, feeds 103 and 105 for water and diesel fuel, a supercritical water (SCW) reactor 201 in fluid communication with the water feed 103 and the diesel fuel 105, at least one pre-heater 107 in thermal communication with the water feed 103 and the diesel fuel 105, a water-gas shift (WGS) reactor 301, and a hydrogen capturing system 405. The at least one pre-heater 107 is configured to heat water from the water feed 103 and diesel fuel from the diesel fuel feed 105 to a predetermined temperature equal to or greater than the critical temperature of water. Water and diesel fuel are fed by the respective feeds 103 and 105 to the

SCW reactor 201 at the predetermined temperature via the at least one pre-heater 107. The SCW reactor 201 is adapted to place the pre-heated water into a supercritical state within the SCW 201. The SCW reactor 201 reforms the diesel fuel into a synthesis gas comprising a mixture of hydrogen and carbon monoxide and outputs the synthesis gas. The synthesis gas output by the SCW reactor 201 is fed into the WGS reactor 301 which converts the carbon monoxide of the synthesis gas into carbon dioxide and hydrogen and outputs an output gas including a higher percentage of hydrogen to carbon monoxide compared to the synthesis gas. The hydrogen in the output gas is captured by the hydrogen capturing system 405.

In the Office Action of September 30, 2008, the Examiner admits that *Hokari* fails to disclose the presence of at least one pre-heater in thermal communication with said fuel feed and configured to preheat fuel to a predetermined temperature equal to or greater than the critical temperature of water. See, Office Action September 30, 2008 at Page 6, l. 16-18. The Examiner asserts that *Wright* teaches these limitations that are missing from the teachings of *Hokari*.

Applicant respectfully disagrees. *Wright* discloses an electrical generating plant that has a fuel cell that requires a supply of gaseous hydrogen and gaseous oxygen in order to generate an electrical output. See, *Wright*, Abstract. *Wright* further discloses a first supply means for supplying a hydrogen-containing compound (preferably methanol) that undergoes a two part endothermic reaction in a reformer to liberate gaseous hydrogen. *Wright* also discloses three heat exchangers which are used to preheat a fuel and water mixture. However, the heat exchangers in *Wright* are effective to heat the fuel and water mixture to only **80% of the temperature required for a reaction**. See, U.S. Pat. No. 5,141,823, Col. 7, l. 29-34. This is clearly unlike the claimed invention which heats a fuel, water and air mixture **to greater than or**

**equal to the critical temperature of water.** Under *Wright*, the temperature of the fuel and water mixture would only be heated to 80% of the required temperature for reaction, the critical temperature of water in the claimed invention, which does not provide the same benefits of the claimed invention.

As the Applicant's specification discloses, by pre-heating the water to a temperature at or above the critical temperature of water using at least one pre-heater, the SCWR operates in a more efficient manner while also placing less of a requirement on the SCWR resulting in faster production of hydrogen. See, Original Application, at pg. 11, line 20 to pg. 12, line 2.

Accordingly, Applicants submit that *Hokari* and *Wright* (alone or in combination) fail to teach or suggest all of the limitations of claim 18, and respectfully request that the rejection of claim 18 be withdrawn.

Independent claims 26 and 27 as amended have water and fuel preheating and SCW reactor requirements (as well as other limitations) similar to claim 18. Thus, claims 26 and 27 should be deemed allowable for at least the same reasons as claim 18.

Claims 19-25 depend, directly or indirectly, from claim 18 and, thus, should be deemed allowable for at least the same reasons as provided for claim 18.

Claims 28-35 depend, directly or indirectly, from claim 27 and, thus, should be deemed allowable for at least the same reasons as provided for claim 27.

**IV. Conclusion**

In view of the above amendments and remarks, Applicant submits that claims 18-35 are clearly allowable over the cited prior art, and respectfully requests early and favorable notification to that effect.

Respectfully submitted,

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